Amendments to the Claims

Please cancel Claims 1-2, 4-8, 25-26, and 28-32. Please amend Claims 3, 9-10, 12, 15-22, 27, 33-37, 39-42, and 44-47. Please add new Claims 49-58. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (Cancelled)

2. (Cancelled)

3. (Currently Amended) The pump of claim [[2]] 49 in which the connecting member includes a threaded screw, the drive system including ~~a rotatable nut engaged with the threaded screw and~~ a reversible motor engaging the threaded screw for alternately ~~rotating~~ moving the ~~nut~~ connecting member in opposite directions, to cause reciprocating linear translation of the connecting member and pistons.

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Currently Amended) The pump of claim [[1]] 49 further comprising a piston position sensing system coupled to the drive system to detect when the pistons have reached a predetermined stroke and to reverse the drive system.

10. (Currently Amended) The pump of claim [[1]] 49 further comprising a first pressure sensor for sensing pressure in the first piston chamber.

11. (Original) The pump of claim 10 further comprising a second pressure sensor for sensing pressure of fluid expelled from the second piston chamber.

12. (Currently Amended) The pump of claim [[1]] 49 in which the ~~diameters of the first and second pistons have a difference in size of about a 3.5 to 1~~ ratio of the volume of the first piston chamber to the volume of the second piston chamber is about 12.5 to 1.0.

13. (Original) The pump of claim 12 in which the first and second pistons have a stroke of about 6 inches.

14. (Original) The pump of claim 13 in which the pump is capable of pumping about 0.5 $in.^3$ of gas at about 2200 psi per cycle.

15. (Currently Amended) A pump for compression a volume of fluid comprising:

a housing having a first cylindrical chamber and a second cylindrical chamber, the first chamber having a first inlet and a first outlet, the second chamber having a second inlet and a second outlet, the second inlet of the second chamber being in communication with the first outlet of the first chamber;

a first piston positioned within the first chamber to define a first piston chamber;

a second piston positioned within the second chamber to define a second piston chamber ~~and secured to the first piston, the first and second pistons each having a diameter, the diameter of the first piston being larger than the diameter of the second piston~~ the volume of the first piston chamber being larger than the volume of the second piston chamber;

a connecting member for securing the first and second pistons together in a spaced apart manner along a common axis, and extending between the first and second chambers, the connecting member including a threaded screw;

a drive system for reciprocating the first and second pistons in unison within the first and second piston chambers such that when the first piston is moving in an expansion stroke, fluid ~~can be~~ is drawn into the first piston chamber through the first inlet, and at the same time, the second piston is moving in a compression stroke where fluid ~~can be~~ is expelled from the second piston chamber through the second outlet, and when the first piston is moving in a compression stroke, the second piston is moving in an expansion stroke where fluid ~~can be~~ is expelled from the first piston chamber through the first outlet and into the second piston chamber through the second inlet where the fluid is compressed due to the reduced volume of the second piston chamber, the drive system including a rotatable ball screw nut engaged with the threaded screw and a reversible motor for alternately rotating the nut in opposite directions to cause reciprocating linear translation of the connecting member and pistons; and

a check valve system for ~~preventing back~~ maintaining a unidirectional flow ~~through the pump~~ of fluid from the first inlet to the second outlet.

16. (Currently Amended) The pump of claim 15 in which the check valve system comprises a first check valve in communication with the first inlet for preventing fluid from exiting the first piston chamber through the first inlet.

17. (Currently Amended) The pump of claim 16 in which the check valve system further comprises a second check valve disposed between the first outlet and the second inlet for preventing fluid from exiting the second piston chamber through the second inlet.

18. (Currently Amended) The pump of claim 17 in which the check valve system further comprises a third check valve in communication with the second outlet for preventing fluid from entering the second piston chamber through the second outlet.

19. (Currently Amended) The pump of claim 15 further comprising a piston position sensing system coupled to the drive system to detect when the pistons have reached a predetermined stroke and to reverse the drive system.

20. (Currently Amended) The pump of claim 15 further comprising a first pressure sensor for sensing fluid pressure in the first piston chamber.

21. (Currently Amended) The pump of claim 20 further comprising a second pressure sensor for sensing the pressure of fluid expelled from the second piston chamber.

22. (Currently Amended) The pump of claim 15 in which the ~~diameters of the first and second pistons have a difference in size of about a 3.5 to 1~~ ratio of the volume of the first piston chamber to the volume of the second piston chamber is about 12.5 to 1.0.

23. (Original) The pump of claim 22 in which the first and second pistons have a stroke of about 6 inches.

24. (Original) The pump of claim 23 in which the pump is capable of pumping about 0.5 $in.^3$ of gas at about 2200 psi per cycle.

25. (Cancelled)

26. (Cancelled)

27. (Currently Amended) The method of claim [[26]] 54 in which the connecting member includes a threaded screw, the drive system including ~~a rotatable nut engaged with the threaded screw~~ a reversible motor engaging the threaded screw, the method further comprising alternately rotating the ~~nut~~ connecting member in opposite directions with [[a]] the reversible motor to cause reciprocating linear translation of the connecting member and pistons.

28. (Cancelled)

29. (Cancelled)

30. (Cancelled)

31. (Cancelled)

32. (Cancelled)

33. (Currently Amended) The method of claim [[25]] 54 further comprising sensing piston position with a piston position sensing system.

34. (Currently Amended) The method of claim [[25]] 54 further comprising sensing fluid pressure in the first piston chamber with a first pressure sensor.

35. (Currently Amended) The method of claim 34 further comprising sensing pressure of fluid expelled from the second piston chamber with a second pressure sensor.

36. (Currently Amended) The method of claim [[25]] 54 ~~further comprising forming the diameters of the first and second pistons to have a difference in size of about a 3.5 to 1~~ wherein the ratio of the volume of the first piston chamber to the volume of the second piston chamber is about 12.5 to 1.0.

37. (Currently Amended) The method of claim 36 ~~further comprising providing~~ wherein the first and second pistons ~~with~~ have a stroke of about 6 inches.

38. (Original) The method of claim 37 further comprising pumping about 0.5 $in.^3$ of gas at about 2200 psi per cycle.

39. (Currently Amended) A method of ~~pumping~~ compressing a volume of fluid comprising:

~~positioning~~ operating a first piston within a first cylindrical chamber defining a first piston chamber in a housing, the first piston chamber having a first inlet and a first outlet;

~~positioning~~ operating a second piston within a second cylindrical chamber defining a second piston chamber in the housing, ~~the first and second pistons being secured to each other and each having a diameter, the diameter of the first piston being larger than the diameter of the second piston, the second chamber having a second inlet and a second outlet, the second inlet being in communication with the first outlet of the first chamber~~ the volume of the first piston chamber being larger than the volume of the second piston chamber;

~~securing~~ maintaining the first and second pistons secured together in a spaced apart manner along a common axis with a connecting member ~~extending between the first and second chambers~~, the connecting member including a threaded screw;

reciprocating the first and second pistons in unison within the first and second piston chambers with a drive system such that when the first piston is moving in an expansion stroke, fluid is drawn into the first piston chamber through the first inlet, and at the same time, the second piston is moving in a compression stroke where fluid is expelled from the second piston chamber through the second outlet, and when the first piston is moving in a compression stroke, the second piston is moving in an expansion stroke where fluid is expelled from the first piston chamber through the first outlet and into the second piston chamber through the second inlet where the fluid is compressed due to the reduced volume of the second piston chamber, the drive system including a rotatable ball screw nut engaged with the threaded screw and a reversible motor for alternately rotating the nut in opposite directions to cause reciprocating linear translation of the connecting member and pistons; and

~~preventing back~~ maintaining a unidirectional flow ~~through the pump~~ of fluid from the first inlet to the second outlet with a check valve system

40. (Currently Amended) The method of claim 39 further comprising preventing fluid from exiting the first piston chamber through the first inlet with a first check valve of the check valve system.

41. (Currently Amended) The method of claim 40 further comprising preventing fluid from exiting the second piston chamber through the second inlet with a second check valve of the check valve system.

42. (Currently Amended) The method of claim 41 further comprising preventing fluid from entering the second piston chamber through the second outlet with a third check valve of the check valve system.

43. (Original) The method of claim 39 further comprising sensing piston position with a piston position sensing system.

44. (Currently Amended) The method of claim 39 further comprising sensing fluid pressure in the first piston chamber with a first pressure sensor.

45. (Currently Amended) The method of claim 44 further comprising sensing pressure of fluid expelled from the second piston chamber with a second pressure sensor.

46. (Currently Amended) The method of claim 39 ~~further comprising forming the diameters of the first and second pistons to have a difference in size of about a 3.5 to 1~~ wherein the ratio of the volume of the first piston chamber to the volume of the second piston chamber is about 12.5 to 1.0.

47. (Currently Amended) The method of claim 46 ~~further comprising providing~~ wherein the first and second pistons ~~with~~ have a stroke of about 6 inches.

48. (Original) The method of claim 47 further comprising pumping about 0.5 $in.^3$ of gas at about 2200 psi per cycle.

49. (New) A multi-stage pump for pressurizing a volume of a fluid, comprising:

a housing having an input line for receiving a fluid at a specified input pressure and an output line for delivering the fluid at a specified output pressure higher than the specified input pressure;

a first piston operable in an expansion stroke and a compression stroke in a first piston chamber in the housing, the first piston chamber having a first inlet in fluid communication with the input line and a first outlet, wherein during the expansion stroke fluid is drawn into the first piston chamber through the first inlet at the first specified pressure and during the compression stroke the fluid is forced out through the first outlet;

a second piston operable in an expansion stroke and a compression stroke in a second piston chamber in the housing, the second piston chamber having a second inlet in fluid communication with the first outlet of the first piston chamber and a second outlet in fluid communication with the output line, wherein the second piston chamber has a smaller volume than the first piston chamber, wherein during the expansion stroke fluid is drawn into the second piston chamber through the second inlet and during the compression stroke the fluid is forced out through the second outlet at the second specified pressure;

a first check valve to prevent fluid flow from the first inlet to the input line;

a second check valve to prevent fluid flow from the second inlet to the first outlet;

a third check valve to prevent fluid flow from the output line to the second outlet;

a connecting member securing the first piston and the second piston together in a spaced apart manner along a common axis, the connecting member having threads along a portion of its length;

a ball screw drive system in communication with the threads on the connecting member for reciprocating the connecting member such that when the first piston is in an expansion stroke, the second piston is in a compression stroke, and when the first piston is in a compression stroke, the second piston is in an expansion stroke.

50. (New) The pump of Claim 49 wherein the fluid is a gas.

51. (New) The pump of Claim 50 wherein the gas includes concentrated oxygen.

52. (New) The pump of Claim 15 wherein the fluid is a gas.

53. (New) The pump of Claim 52 wherein the gas includes concentrated oxygen.

54. (New) A method for pressurizing a volume of a fluid, comprising:

receiving a fluid at a specified input pressure into a housing through an input line and delivering the fluid at a specified output pressure higher than the specified input pressure through an output line;

operating a first piston in an expansion stroke and a compression stroke in a first piston chamber in the housing, the first piston chamber having a first inlet in fluid communication with the input line and a first outlet, wherein during the expansion stroke fluid is drawn into the first piston chamber through the first inlet at the first specified pressure and during the compression stroke the fluid is forced out through the first outlet;

operating a second piston in an expansion stroke and a compression stroke in a second piston chamber in the housing, the second piston chamber having a second inlet in fluid communication with the first outlet of the first piston chamber and a second outlet in fluid communication with the output line, wherein the second piston chamber has a smaller volume than the first piston chamber, wherein during the expansion stroke fluid is drawn into the second piston chamber through the second inlet and during the compression stroke the fluid is forced out through the second outlet at the second specified pressure;

preventing fluid flow from the first inlet to the input line using a first check valve;

preventing fluid flow from the second inlet to the first outlet using a second check valve;

preventing fluid flow from the output line to the second outlet using a third check valve;

securing the first piston and the second piston together with a connecting member in a spaced apart manner along a common axis, the connecting member having threads along a portion of its length;

operating a ball screw drive system in communication with the threads on the connecting member to reciprocate the connecting member such that when the first piston is in an expansion stroke, the second piston is in a compression stroke, and when the first piston is in a compression stroke, the second piston is in an expansion stroke.

55. (New) The method of Claim 54 wherein the fluid is a gas.

56. (New) The method of Claim 55 wherein the gas includes concentrated oxygen.

57. (New) The method of Claim 39 wherein the fluid is a gas.

58. (New) The method of Claim 57 wherein the gas includes concentrated oxygen.